(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－224592
（P2002－224592A）
(43)公開日　平成14年８月13日(2002.8.13)

(51)Int.Cl.[7]		識別記号	FI		テーマコード(参考)
Ｂ０５Ｂ	1/34	１０１	Ｂ０５Ｂ	1/34	１０１　４Ｆ０３３
	7/10			7/10	

審査請求　未請求　請求項の数４　ＯＬ　（全６頁）

(21)出願番号　特願2001－25161(P2001－25161)

(22)出願日　平成13年２月１日(2001.2.1)

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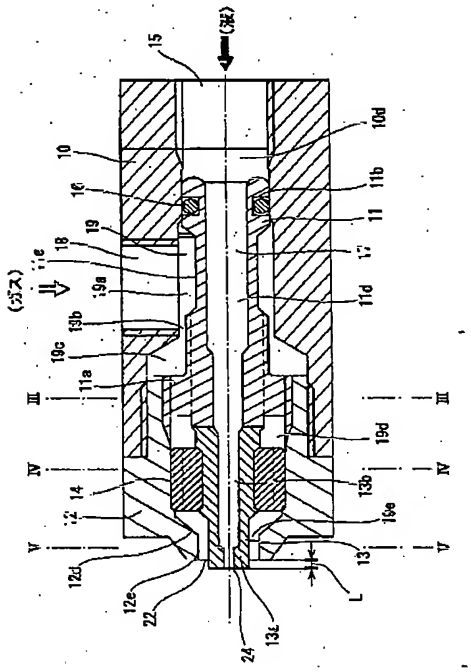
Ｆターム(参考)　4F033 QB02Y QB03X QB15X QB17 QD02 QD19 QD24 QE24

(54)【発明の名称】　ノズル

(57)【要約】
【課題】　液体と気体を外部混合させる二流体ノズルを改良する。
【解決手段】　ノズル本体からなる外筒と、ノズルチップからなる内筒とを備え、内筒の中空部を液体流路とすると共に内筒と外筒の間を環状の気体流路とし、上記気体流路に旋回部材を介設して気体を旋回させながら外筒先端の気体噴射口から噴射させるようにし、かつ、上記内筒先端を外筒より僅かに突出させて、該内筒先端の液体噴射口より噴射する液体に、上記旋回して噴射される気体を外部混合する。



【特許請求の範囲】
【請求項１】　ノズル本体からなる外筒と、ノズルチップからなる内筒とを備え、内筒の中空部を液体流路とすると共に内筒と外筒の間を環状の気体流路とし、
上記気体流路に旋回部材を介設して気体を旋回させながら外筒先端の気体噴射口から噴射させるようにし、かつ、上記内筒先端を外筒より僅かに突出させて、該内筒先端の液体噴射口より噴射する液体に、上記旋回して噴射される気体を外部混合して噴霧させる構成としていることを特徴とするノズル。
【請求項２】　上記内筒先端部が外筒先端部より突出する長さを、１ｍｍ以下に設定している請求項１に記載のノズル。
【請求項３】　上記旋回部材は、内筒外周面と外筒内周面に当接する円環形状の本体外周面に、周方向に間隔をあけて、軸線方向が傾斜した旋回溝を複数個設けているものである請求項１または請求項２に記載のノズル。
【請求項４】　上記ノズルは、ダクトを流れる排ガスに還元剤を含む液体を噴霧し、排ガス中の窒素酸化物を還元除去するために用いるもので、
上記気体としてガスを用い、上記内筒先端の液体噴射口より噴射する還元剤を含む液体に、上記旋回して噴射されるガスを外部混合して排ガス中に噴霧させる構成としている請求項１乃至請求項３のいずれか一項に記載のノズル。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、ノズルに関し、詳しくは、噴霧される液体に対して、その外周より気体を外部混合させて噴霧するノズルに関し、特に、排ガス中の窒素酸化物を還元除去するために、還元剤を含む液体をガスと混合させて排ガス中に噴霧させるノズル等として好適に用いられるものである。
【０００２】
【従来の技術】従来、この種の排ガス中の窒素酸化物を除去するために用いるノズルとして、特開平５－２６９３４８号に図９に示すノズル１が提案されている。該ノズル１は、内管２と外管３を備えた二重管構造で、内管先端部２ａが外管先端部３ａより突出した構成としている。上記内管２の中空部を還元剤を含む液体の流路４とし、内管２と外管３の間をガス流路５とし、流路４の先端から噴射する上記水溶液に流路５の先端から噴射するガスを外部混合して排ガス中に噴霧させ、触媒の存在下に排ガス中の窒素酸化物を選択的に還元除去している。
【０００３】上記ノズル１では、内管２と外管３の間の流路５にガスを通過させることにより、ノズル外部からノズル内筒への伝熱を抑制して、ノズル先端部において還元剤の結晶化や反応物生成によるノズルの目詰まり等を軽減している。また、内管先端部２ａを外管先端部３ａより突出させていることで、還元剤を含む液体を霧状に噴霧できるようになり、排ガス中への混合がおこなわれる。
【０００４】
【発明が解決しようとする課題】上記ノズルでは、内筒先端部を外筒先端部よりも突出させていることで、還元剤を含む液体を霧状に噴霧できるものの、内筒の突出長さが短いと還元剤の液滴が内筒の外壁を伝って外筒と対向するガス噴射口の壁面に付着し、これが固化してガス噴射口に還元剤が蓄積し、ガス噴射口を閉塞しやすい問題がある。一方、内筒の突出長さが長くなると、ガス噴射口から噴射されるガスと還元剤を含む液体との外部混合時にガス圧が低下し、液体が十分に微粒化されず、排ガス中への還元剤を含む液体の分散状態も悪くなる問題がある。
【０００５】上記ガス中の窒素酸化物の還元除去用のノズルに限らず、目詰まりが発生しやすい液体を気体と外部混合させて噴霧するノズルにおいて、液体噴霧用の内筒先端を外筒より突出させた構成のノズルにおいて、内筒突出量を大きくすると、上記問題が発生する。
【０００６】本発明は上記問題に鑑みてなされたもので、ガス噴射口に液体が付着しないようにすると共に、ガス圧が低下しない状態で上記液体とガスとを外部混合させ、液体の微粒化の促進および均一分布の促進を図ることを課題としている。
【０００７】
【課題を解決するための手段】上記課題を解決するため、本発明は、ノズル本体からなる外筒と、ノズルチップからなる内筒とを備え、内筒の中空部を液体流路とすると共に内筒と外筒の間を環状の気体流路とし、上記気体流路に旋回部材を介設して気体を旋回させながら外筒先端の気体噴射口から噴射させるようにし、かつ、上記内筒先端を外筒より僅かに突出させて、該内筒先端の液体噴射口より噴射する液体に、上記旋回して噴射される気体を外部混合して噴霧させる構成としていることを特徴とするノズルを提供している。
【０００８】上記ノズルは排ガス中の窒素酸化物の還元除去用のノズルとして好適に用いられる。即ち、ダクトを流れる排ガスに還元剤を含む液体を噴霧し、排ガス中の窒素酸化物を還元除去するために用いるノズルであって、ノズル本体からなる外筒と、ノズルチップからなる内筒とを備え、内筒の中空部を液体流路とすると共に内筒と外筒の間を環状のガス流路とし、上記ガス流路に旋回部材を介設してガスを旋回させながら外筒先端のガス噴射口から噴射させるようにし、かつ、上記内筒先端を外筒より僅かに突出させて、該内筒先端の液体噴射口より噴射する液体に、上記旋回して噴射されるガスを外部混合して排ガス中に噴霧させる構成としている。
【０００９】上記のように、内筒と外筒の間のガス等の気体流路に、旋回部材を介在させていることにより、気体噴射口から気体が旋回流れとなって噴射され、気体噴

射口の内筒外周面に液滴が付着していても、旋回流により液滴を飛散させることができ、気体噴射口に還元剤が硬化して目詰まりが発生するのを防止できる。さらに、気体噴射口から僅かに突出している内筒外周面に液滴が付着しても気体の旋回流で飛散させることができると共に、内筒先端開口の液体噴射口に残留する液滴も気体の旋回流で飛散させて、液体噴射口の目詰まり発生も防止できる。

【００１０】さらに、気体を旋回させていることにより、内筒から噴射される液体と気体とを外部混合した時に、液体の均一な分布と液体の微粒化を促進することができる。その結果、液体として還元剤を含む液体を用い、ガスと外部混合させた場合、排気ガス中の窒素酸化物の脱硝作用を促進することができる。かつ、外筒からの内筒の突出量を僅かとしているため、内筒から噴射される液体を高圧ガスで混合させることができ、この点からも還元剤を含む液体のガス中への均一な分布と微粒化を更に促進させることができる。

【００１１】具体的には、内筒の突出量は１ｍｍ以下としている。このように、突出量を僅かとしても、気体を旋回させていることにより、上記のように、内筒外周面および気体噴射口の内外周面に付着する液滴を飛散させるために、目詰まり発生を防止できる。

【００１２】上記旋回部材として、内筒外周面と外筒内周面に当接する円環形状の本体外周面に、周方向に間隔をあけて、軸線方向が傾斜した旋回溝を複数個設けているものが好適に用いられる。なお、旋回部材の形状は上記形状に限定されず、気体に旋回流を発生させる構造であれば適宜に採用しえる。

【００１３】脱硝用ノズルの場合、上記内筒に供給する還元剤は、化学反応によってNH_3を発生する物質を用いており、常温で固体の固体還元剤、常温で液体の液体還元剤のいずれでもよい。

【００１４】なお、本発明のノズルは、排ガス中の窒素酸化物を還元除去する脱硝用ノズルとして好適に用いられるものであるが、他の用途にも用いることが出来ることは言うまでもない。即ち、床・壁面用タイルの表面に釉薬をエアと混合して噴霧状態で塗布する釉薬噴霧用ノズル、サンドブラストや表面処理剤添加の研磨剤、研磨性溶液の噴霧用、防虫や殺菌用の水和剤噴射用のノズル等としても好適に用いられる。

【００１５】

【発明の実施の形態】以下、本発明の実施の形態を詳述する。図１は脱硝用ノズルの断面図であり、１０はノズルアダプター、１１はステム、１２はノズル本体、１３はノズルチップ、１４は旋回部材である。上記ノズルアダプター１０の先端にノズル本体１２を螺着して外筒を構成し、ノズルアダプター１０の内部に軸線に沿って取り付けるステム１１と、該ステム１１の先端に連結するノズルチップ１３とで内筒を構成している。

【００１６】上記ステム１１は、その前部大径部１１ａの外周面に形成したネジ部をノズル本体１２の内周面に形成したネジ部に螺着して組みつけ、後部大径部１１ｂの外周面に嵌着したＯリング１６をノズルアダプター１０の内周面に圧接させてシールしている。

【００１７】ステム１１の前端に連続させるノズルチップ１３は、旋回溝１４ａを有する旋回部材１４を外嵌した状態でノズル本体１２内に嵌合し、旋回部材１４をノズル本体１２内に内嵌固定することにより、ノズルチップ１３をステム１１の前端に連続した状態でノズル本体１２内に固定している。

【００１８】ノズルチップ１３は噴射側前端部に小径部１３ａを設けており、ノズルチップ１３をノズル本体１２に組み付けた状態で、図１および図６に示すように、ノズルチップ１３の小径部１３ａの先端部をノズル本体１２の先端のガス（気体）噴射口２２より外方へ１ｍｍ以下の突出量Ｌで突出させている。

【００１９】ノズルチップ１３の中空部１３ｂはステム１１の中空部１１ｄと連通し、ステム１１の中空部１１ｄの後端開口はノズルアダプター１０の後端側中空部１０ｄに連通し、この連通した中空部を液体流路１７としている。上記ノズルアダプター１０の中空部１０ｄの後端開口を液体導入口１５とし、該液体導入口１５に液体供給配管（図示せず）を螺着し、液体流路１７に脱硝用の還元剤を含む液体を供給している。

【００２０】上記液体流路１７は液体導入口１５から先端の液体噴射口２４にかけて、段階的に内径を狭くし、ノズルチップ１３の先端の小径部１３ａの内径を最も狭くしている。この小径部先端の液体噴射口２４を、前記したように、ノズルチップ１３の外周面とノズル本体１２の先端内周面の間に形成するガス噴射口２２よりも、１ｍｍ以下突出させ、液体にガスを外部混合させるようにしている。

【００２１】一方、上記ステム１１およびノズルチップ１３の外周面と上記ノズルアダプター１０およびノズル本体１２の内周面の間にはガス（気体）流路１９を設けている。ガス（気体）導入口１８はノズルアダプター１０の軸方向中央部の一側面に設け、該ガス導入口１８にガス（気体）供給管（図示せず）を螺着するようにしている。

【００２２】上記ガス導入口１８からガス噴射口２２にかけるガス流路１９は、まず、ガス噴射口２２の後端側において、上記ステム１１に装着したＯリング１６をノズルアダプター１０の内周面に圧接させてガス流路１９の後端閉鎖部を構成している。ガス導入口１８と対向するノズル本体１２の外周面には凹部１１ｅを設けて、広いガス（気体）導入空間１９ａを形成し、ついで、噴射口側前方にむかって、オリフィス１９ｂ、広いガス（気体）滞留室１９ｃを連続させている。

【００２３】上記ガス滞留室１９ｃの前端側に、上記ス

テム１１の前部大径部１１ａが位置し、図３に示すように、この前部大径部１１ａに周方向に間隔をあけてガス流路となる溝１１ｃを設けてガス流路としている。上記溝１１ｃは前方に上記旋回部材１４を介在させている。

【００２４】旋回部材１４は、図７（Ａ）に示すように円筒形状で、周方向に間隔をあけて４ヶ所の軸線方向に対して傾斜させた旋回溝１４ａを設け、図７（Ｂ）に示すように各旋回溝１４ａは流入したガスに旋回を発生させるようにしている。なお、旋回部材は、外周面に開口した溝とする代わりに、図８（Ａ）（Ｂ）に示すような旋回孔２６ａを設けた旋回部材２６を用いてもよい。

【００２５】旋回部材１４の前部側には、ノズル本体１２の内周面をテーパ状に縮径させた壁面１２ｄが位置し、該壁面１２ｄの中央部より小径管部１２ｅを突出させている。この小径管部１２ｅの先端はノズルチップ１３の先端より１ｍｍ以下後退させた位置としている。

【００２６】ガス流路１９は、上記ガス滞留室１９ｃより旋回部材１４の溝１４ａを介して上記テーパ状壁面とノズルチップ１３の外周面との間の縮径室１９ｄに連続させて、つづいて、小径管部１２ｅの内周面とノズルチップ外周面の間の幅狭な環状ガス（気体）噴射流路１９ｅに連続させている、この環状ガス噴射流路１９ｅの先端開口がガス噴射口２２となる。

【００２７】次に、上記ノズルにおける噴霧作用について説明する。所要圧力でガスをガス導入口１８よりガス流路１９に導入すると、ガスはオリフィス１９ｂ、ガス滞留室１９ｃを通過した後、ステム１１の溝１１ｃを流通した後、旋回部材１４の旋回溝１４ａに流入する。この旋回溝でガスは旋回流となって、縮径室１９ｄに流入し、ガス圧を高めながら、環状ガス噴射流路１９ｅに流入し、ガス噴射口２２から噴射される。

【００２８】一方、液体流路１７には、還元剤を含む液体を液体導入口１５より導入し、ステム１１内の中空部１１ｄ、ノズルチップ１３の中空部１３ｂからなる液体流路通過して、小径部１３ａの先端の液体噴射口２４より噴射される。

【００２９】上記のように噴射されるガスと液体とは外部混合される。その際、ガスは旋回部材１４により旋回流となっているため、液体との混合が促進され、その結果、液体の微粒化が促進される。しかも、液体噴射口２４に対してガス噴射口２２を１ｍｍ程度と近接させているため、ガス圧が低下しない状態で液体と混合でき、液滴の微粒化をさらに促進できる。

【００３０】また、液体噴射口２４をガス噴射口２２より突出させているため、液体噴射口２４より噴射される還元剤を含む液体がガス噴射口２２付近に接触、付着することを防止できる。かつ、液体噴射口２４の突出量は１ｍｍ程度と微小としているが、ガスを旋回流としているため、ガス噴射口２２の付近に液滴が付着しても、旋回流により液滴を飛散させることができ、よって、還元剤を含む液体が硬化してガス噴射口２２を閉塞するのを防止できる。

【００３１】上記実施形態は脱硝用ノズルとして適用した場合であるが、粘性液体中に鉱物や金属等の微粉末を含有している液体を気体と外部混合して噴霧する他のノズルに本発明のノズルを適用した場合においても、上記と同様な作用を奏することができる。

【００３２】

【発明の効果】以上の説明より明らかなように、本発明によれば、中心に液体、外周に気体を流通させ、液体噴射口を気体噴射口よりも突出させて外部混合するノズルにおいて、外周の気体流路に旋回部材を介在させて気体を旋回流としているため、液体噴射口を構成する内筒のノズルチップの先端を気体噴射口を構成する外筒の先端よりも１ｍｍ程度突出させただけでも、気体噴射口へ付着する液滴をガス旋回流で飛散させることができ、気体噴射口が液滴が硬化して目詰まりが発生するのを防止できる。よって、脱硝用ノズルとして用いた場合、還元剤を含む液滴が硬化してガス噴射口の閉塞することを防止できる。

【００３３】また、液体噴射口を気体噴射口より１ｍｍ以下の微小な寸法で突出させているだけであるため、噴射される液体に対して気体圧を低下させない状態で外部混合でき、しかも、気体を旋回流れとしているため、液体との混合を促進でき、液滴の微粒化が図られる。その結果、均一に液体を噴霧することができ、脱硝用ノズルとした場合に、ガスの脱硝作用を高めることができる。

【図面の簡単な説明】

【図１】　本発明の実施例を示す断面図である。

【図２】　図１の一部破断正面図である。

【図３】　図１のIII— III線断面図である。

【図４】　図１のIV— IV線断面図である。

【図５】　図１のＶ—Ｖ線断面図である。

【図６】　上記実施例の要部拡大図である。

【図７】　（Ａ）は旋回部材の第１実施例の正面図、（Ｂ）は該旋回部材の側面図である。

【図８】　（Ａ）は旋回部材の第２実施例の正面図、（Ｂ）は図８（Ａ）のII—II線断面図である。

【図９】　従来例を示す断面図である。

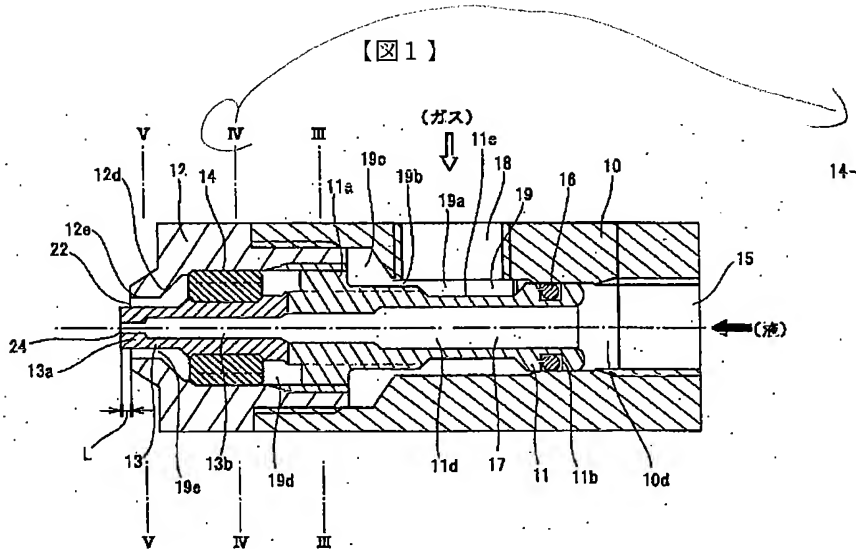
【符号の説明】

１０　ノズルアダプター
１１　ステム
１２　ノズル本体
１３　ノズルチップ
１４　旋回部材
１４ａ　旋回溝
１５　液体導入口
１７　液体流路
１８　ガス（気体）導入口
１９　ガス（気体）流路

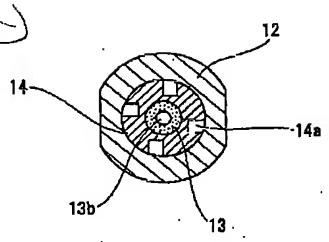
２２　ガス（気体）噴射口

２４　液体噴射口

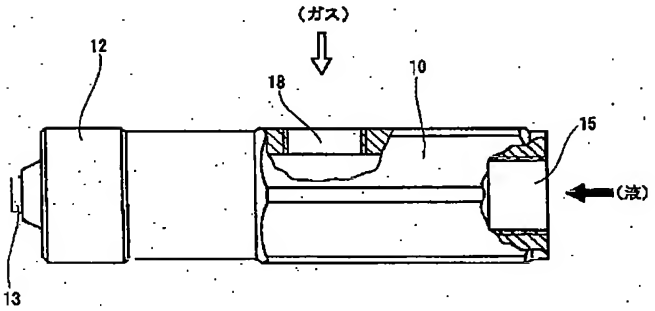
【図１】



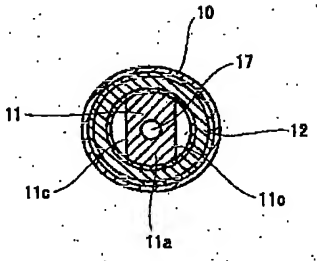
【図４】



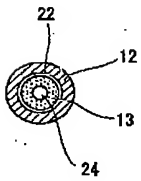
【図２】



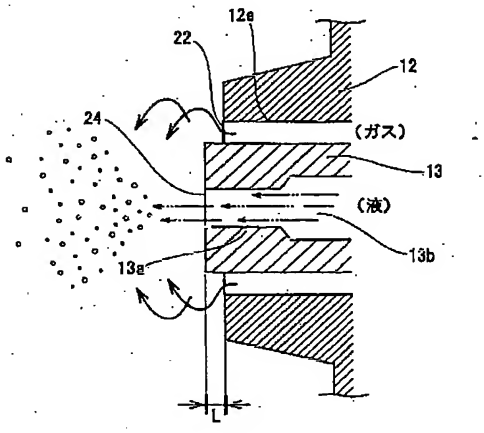
【図３】



【図５】

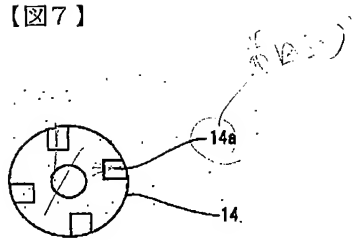


【図６】

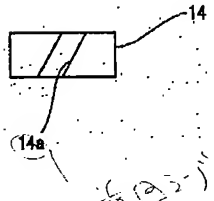


【図7】

(A)

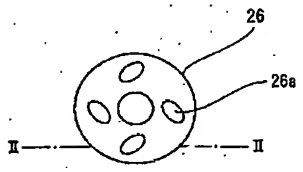


(B)

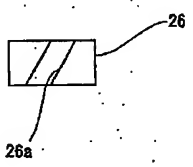


【図8】

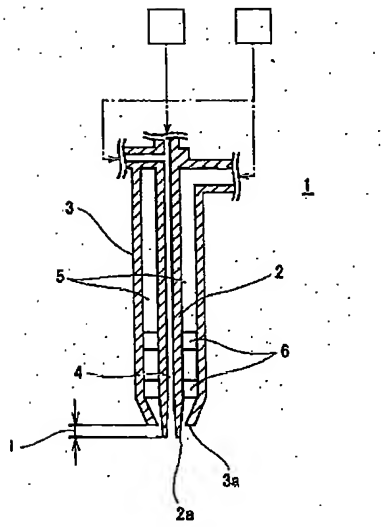
(A)



(B)



【図9】



PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-224592
(43)Date of publication of application : 13.08.2002

(51)Int.Cl. B05B 1/34
B05B 7/10

(21)Application number : 2001-025161
(22)Date of filing : 01.02.2001

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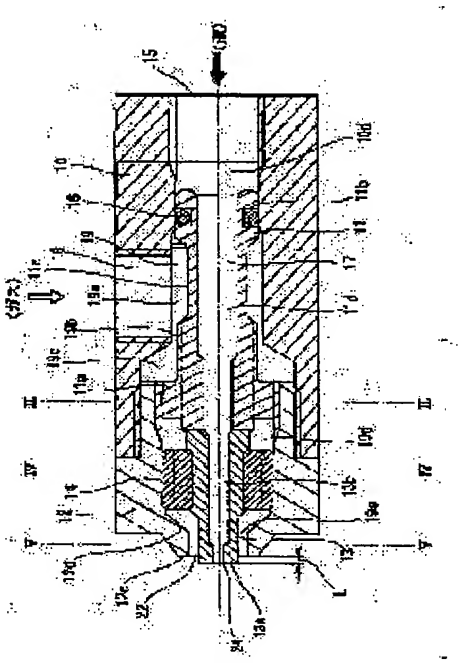
(72)Inventor : ONISHI NORIO
MIZUNO TAKEO

(54) NOZZLE

(57)Abstract:
PROBLEM TO BE SOLVED: To improve a binary fluid nozzle making liquid with gas mix externally.
SOLUTION: The nozzle is provided with an outer cylinder comprising a nozzle body and an inner cylinder comprising a nozzle chip. A hollow part of the inner cylinder is a liquid passage, and a ring-shaped gas passage is formed between the inner cylinder and the outer cylinder. The gas is sprayed from a gas spraying opening at the end of the outer cylinder while the gas is made to revolute through a revolution member provided in the gas passage, and the end of the inner cylinder is slightly projected from the outer cylinder, thereby the sprayed revolution gas is externally mixed with the liquid sprayed from a liquid spray opening of the end of the inner cylinder.



LEGAL STATUS

[Date of request for examination] 02.06.2006

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] While having the outer case which consists of a nozzle body, and the container liner which consists of a nozzle tip and making the centrum of a container liner into liquid passage, between a container liner and outer cases is made into annular gas passage. It is made to make it inject from the gas injection tip at the tip of an outer case, interposing a revolution member in the above-mentioned gas passage, and making it circle in a gas. And the nozzle characterized by considering as the configuration on which carry out external mixing and the gas injected by above-mentioned carrying out revolution by the liquid which the above-mentioned container liner tip is made to project more slightly than an outer case, and is injected from fluid injection opening at this tip of a container liner is made to spray.
[Claim 2] The nozzle according to claim 1 which has set the die length to which the above-mentioned container liner point projects from an outer case point as 1mm or less.
[Claim 3] The above-mentioned revolution member is a nozzle according to claim 1 or 2 which is what has prepared two or more revolution slots where spacing was opened in the hoop direction and the direction of an axis inclined in the body peripheral face of the circular ring configuration which contacts a container liner peripheral face and outer case inner skin.
[Claim 4] It is the nozzle of the publication by any 1 term of claim 1 are carrying out as the configuration which the above-mentioned nozzle sprays the liquid which contains a reducing agent in the exhaust gas which flows a duct , and uses the nitrogen oxides in exhaust gas in order to carry out reduction removal , carries out external mixing of the gas inject by above-mentioned carrying out revolution by the liquid containing the reducing agent inject from fluid injection opening at the above-mentioned tip of a container liner , using gas as the above-mentioned gas , and makes spray into exhaust gas thru/or claim 3 .

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Since in detail carries out reduction removal of the nitrogen oxides in exhaust gas especially to the liquid sprayed about a nozzle about the nozzle which is made to carry out external mixing and sprays a gas from the periphery, it is suitably used by this invention as a nozzle which is made to mix the liquid containing a reducing agent with gas, and is made to spray into exhaust gas.
[0002]
[Description of the Prior Art] The nozzle 1 shown in JP,5-269348,A at drawing 9 is proposed as a nozzle used in order to remove the nitrogen oxides in this kind of exhaust gas conventionally. This nozzle 1 is the double pipe structure equipped with the inner tube 2 and the outer tube 3, and is considered as the configuration which inner-tube point 2a projected from outer-tube point 3a. The centrum of the above-mentioned inner tube 2 is made into the passage 4 of the liquid containing a reducing agent, between an inner tube 2 and outer tubes 3 is made into a gas passageway 5, external mixing of the gas injected from the tip of passage 5 in the above-mentioned water solution injected from the tip of passage 4 is carried out, it is made to spray into exhaust gas and reduction removal of the nitrogen oxides in exhaust gas is alternatively carried out under existence of a catalyst.
[0003] With the above-mentioned nozzle 1, by making the passage 5 between an inner tube 2 and an outer tube 3 pass gas, the heat transfer from the nozzle outside to a nozzle container liner was controlled, and crystallization of a reducing agent, the blinding of the nozzle by reactant generation, etc. are mitigated in a nozzle point. Moreover, by making inner-tube point 2a project from outer-tube point 3a, the liquid containing a reducing agent can be sprayed now in the shape of a fog, and mixing into exhaust gas is performed.
[0004]
[Problem(s) to be Solved by the Invention] Although the liquid containing a reducing agent can be sprayed in the shape of a fog with the above-mentioned nozzle by making the container liner point project rather than an outer case point, when the wire extension of a container liner is short, the drop of a reducing agent is transmitted to the outer wall of a container liner, it adheres to an outer case and the wall surface of the gas injection tip to counter, this solidifies, a reducing agent is accumulated in a gas injection tip, and there is a problem which is easy to blockade a gas injection tip. On the other hand, when the wire extension of a container liner becomes long, gas pressure falls at the time of external mixing with the gas injected from a gas injection tip, and the liquid containing a reducing agent, and a liquid is not fully atomized, but there is a problem to which the distributed condition of the liquid containing the reducing agent to the inside of exhaust gas also worsens.
[0005] In the nozzle which is made to carry out external mixing with a gas, and sprays the liquid which not only the nozzle for reduction removal of the nitrogen oxides in the above-mentioned gas but blinding tends to generate, in the nozzle of a configuration of having made the container liner tip for liquid spraying project from an outer case, if the amount of container liner protrusions is enlarged, the above-mentioned problem will occur.
[0006] While this invention was made in view of the above-mentioned problem and making it a liquid not adhere to a gas injection tip, external mixing of the above-mentioned liquid and the gas is carried out in the condition that gas pressure does not fall, and it is making to aim at promotion of the atomization of liquid, and promotion of homogeneity distribution into the technical problem.

[0007]
[Means for Solving the Problem] This invention is equipped with the outer case which consists of a nozzle body, and the container liner which consists of a nozzle tip in order to solve the above-mentioned technical problem. While making the centrum of a container liner into liquid passage, between a container liner and outer cases is made into annular gas passage. It is made to make it inject from the gas injection tip at the tip of an outer case, interposing a revolution member in the above-mentioned gas passage, and making it circle in a gas. And the above-mentioned container liner tip is made to project more slightly than an outer case. and the nozzle characterized by considering as the configuration on which carry out external mixing and the gas injected by above-mentioned carrying out revolution by the liquid injected from fluid injection opening at this tip of a container liner is made to spray is offered.
[0008] The above-mentioned nozzle is suitably used as a nozzle for reduction removal of the nitrogen oxides in exhaust gas. Namely, the outer case which is the nozzle used in order to spray the liquid which contains a reducing agent in the exhaust gas which flows a duct and to carry out reduction removal of the nitrogen oxides in exhaust gas, and consists of a nozzle body, While having the container liner which consists of a nozzle tip and making the centrum of a container liner into liquid passage, between a container liner and outer cases is made into an annular gas passageway. It is made to make it inject from the gas injection tip at the tip of an outer case, interposing a revolution member in the above-mentioned gas passageway, and making it circle in gas. And the above-mentioned container liner tip is made to project more slightly than an outer case, and it is considering as the configuration which carries out external mixing of the gas injected by above-mentioned carrying out revolution by the liquid injected from fluid injection opening at this tip of a container liner, and is made to spray into exhaust gas.
[0009] As mentioned above, even if the gas became revolution flow from the gas injection tip, it was injected and the drop has adhered to the container liner peripheral face of a gas injection tip by making the revolution member placed between gas passage, such as gas between a container liner and an outer case, it can prevent that can disperse a drop by the revolution style, a reducing agent hardens to a gas injection tip, and blinding occurs. Furthermore, even if a drop adheres to the container liner peripheral face slightly projected from the gas injection tip, while being able to make it disperse in a gaseous revolution style, the

drop which remains to fluid injection opening of container liner tip opening is also dispersed in a gaseous revolution style, and blinding generating of fluid injection opening can also be prevented.
[0010] Furthermore, when external mixing of the liquid and gas which are injected from a container liner by making it circle in a gas is carried out, uniform distribution and the uniform atomization of liquid of a liquid can be promoted. Consequently, when external mixing is carried out with gas using the liquid which contains a reducing agent as a liquid, a denitrification operation of the nitrogen oxides in exhaust gas can be promoted. And since the amount of protrusions of the container liner from an outer case is made small, the liquid injected from a container liner can be mixed with high pressure gas, and the uniform distribution and the atomization to the inside of the gas of the liquid which contains a reducing agent also from this point can be promoted further.
[0011] Specifically, the amount of protrusions of a container liner is set to 1mm or less. Thus, blinding generating can be prevented in order to disperse the drop which adheres to a container liner peripheral face and the inside-and-outside peripheral surface of a gas injection tip as mentioned above by making it circle in a gas also as small in the amount of protrusions.
[0012] As the above-mentioned revolution member, spacing is opened in a hoop direction and what has prepared two or more revolution slots where the direction of an axis inclined is suitably used for the body peripheral face of the circular ring configuration which contacts a container liner peripheral face and outer case inner skin. In addition, the configuration of a revolution member is not limited to the above-mentioned configuration, but if it is the structure of making a gas generating a revolution style, it can be adopted suitably.
[0013] In the case of the nozzle for denitrification, in ordinary temperature, the matter which generates NH3 is used by the chemical reaction, and any of the liquid reducing agent of a liquid are [the reducing agents supplied to the above-mentioned container liner may be a solid solid-state reducing agent and ordinary temperature, and] sufficient as them.
[0014] In addition, although the nozzle of this invention is suitably used as a nozzle for denitrification which carries out reduction removal of the nitrogen oxides in exhaust gas, it cannot be overemphasized that it can use for other applications. That is, it is suitably used also as the nozzle for cover coat spraying and sandblasting which are mixed with air on the front face of a floor and the tile for wall surfaces, and apply a cover coat to it in the state of spraying, the abrasive material of finishing agent addition, the object for spraying of a polish nature solution, insect control, the nozzle for the water-dispersible-powder injection for sterilization, etc.
[0015]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained in full detail. Drawing 1 is the sectional view of the nozzle for denitrification, and, for a nozzle adapter and 11, as for a nozzle body and 13, a stem and 12 are [10 / a nozzle tip and 14] revolution members. A nozzle body 12 is screwed on at the tip of the above-mentioned nozzle adapter 10, an outer case is constituted, and the container liner consists of a stem 11 attached in the interior of a nozzle adapter 10 along with an axis, and a nozzle tip 13 connected at the tip of this stem 11.
[0016] the above-mentioned stem 11 should screw on and clinch the screw section which formed in the inner skin of a nozzle body 12 the screw section formed in the peripheral face of the anterior part major diameter 11a -- the pressure welding of O ring 16 attached in the peripheral face of posterior part major diameter 11b is carried out to the inner skin of a nozzle adapter 10, and it is carrying out the seal to it.
[0017] By fitting in in a nozzle body 12, where the revolution member 14 which has revolution slot 14a is attached outside, and carrying out inner fitting immobilization of the revolution member 14 into a nozzle body 12, the nozzle tip 13 made to follow the front end of a stem 11 is fixing the nozzle tip 13 in a nozzle body 12, where the front end of a stem 11 is followed.
[0018] The point of narrow diameter portion 13a of a nozzle tip 13 is made to project in the amount L of protrusions of 1mm or less to the method of outside [injection tip / 22 / of the tip of a nozzle body 12 / gas (gas)], as the nozzle tip 13 has prepared narrow diameter portion 13a in the injection side front end section, is in the condition which attached the nozzle tip 13 to the nozzle body 12 and shows it to drawing 1 and drawing 6 .
[0019] Centrum 13b of a nozzle tip 13 is open for free passage with 11d of centrums of a stem 11, and back end opening of 11d of centrums of a stem 11 is open for free passage to 10d of back end side centrums of a nozzle adapter 10, and makes this centrum that was open for free passage the liquid passage 17. Back end opening of 10d of centrums of the above-mentioned nozzle adapter 10 is used as the liquid inlet 15, a liquid charging line (not shown) is screwed on this liquid inlet 15, and the liquid containing the reducing agent for denitrification is supplied to the liquid passage 17.
[0020] A bore is narrowed gradually, liquid applying [above-mentioned / 17] it to the fluid injection opening 24 at a tip from the liquid inlet 15, and it makes the narrowest the bore of narrow diameter portion 13a at the tip of a nozzle tip 13. He makes it project 1mm or less, and is trying to make a liquid carry out external mixing of the gas, as the fluid injection opening 24 at this tip of a narrow diameter portion was described above rather than the gas injection tip 22 formed between the peripheral face of a nozzle tip 13, and the tip inner skin of a nozzle body 12.
[0021] On the other hand, the gas (gas) passage 19 is formed between the inner skin of the above-mentioned stem 11, the peripheral face of a nozzle tip 13 and the above-mentioned nozzle adapter 10, and a nozzle body 12. He establishes the gas (gas) inlet 18 in one side face of the shaft-orientations center section of the nozzle adapter 10, and is trying to screw a gas (gas) supply pipe (not shown) on this gas inlet 18.
[0022] First, the gas passageway 19 applied to the gas injection tip 22 from the above-mentioned gas inlet 18 carries out the pressure welding of O ring 16 with which the back end side of the gas injection tip 22 was equipped at the above-mentioned stem 11 to the inner skin of a nozzle adapter 10, and constitutes the back end closing section of a gas passageway 19. Crevice 11e is prepared in a gas inlet 18 and the peripheral face of the nozzle body 12 which counters, large gas (gas) installation space 19a is formed, and, subsequently orifice 19b and large gas (gas) stagnation room 19c are made to continue toward the injection-tip side front.
[0023] As anterior part major diameter 11a of the above-mentioned stem 11 is located in the front end side of the above-mentioned gas stagnation room 19c and it is shown in drawing 3 , slot 11c which opens spacing in a hoop direction at this anterior part major diameter 11a, and becomes a gas passageway is prepared, and it is considering as the gas passageway. The above-mentioned slot 11c is making the above-mentioned revolution member 14 intervene ahead.
[0024] The revolution member 14 is a cylindrical shape-like, as shown in drawing 7 (A), and he prepares revolution slot 14a which opened spacing in the hoop direction and was made to incline to the four directions of an axis, and is trying for each revolution slot 14a to make the gas which flowed generate revolution, as shown in drawing 7 (B). In addition, the revolution member 26 which prepared revolution hole 26a as shown in drawing 8 (A) and (B) may be used for a revolution member instead of considering as the slot which carried out opening to the peripheral face.

[0025] 12d of wall surfaces which made the diameter of the inner skin of a nozzle body 12 reduce in the shape of a taper is located in the anterior part side of the revolution member 14, and minor diameter tube part 12e is made to project from the center section which is 12d of these wall surfaces. The tip of this minor diameter tube part 12e is made into the location retreated 1mm or less from the tip of a nozzle tip 13.
[0026] A gas passageway 19 is made to follow diameter reduction room 19d between the above-mentioned taper-like wall surface and the peripheral face of a nozzle tip 13 through slot 14a of the revolution member 14 from the above-mentioned gas stagnation room 19c, continues, and tip opening of this annular gas injection passage 19e made to follow annular gas (gas) injection passage 19e narrow [between the inner skin of minor diameter tube part 12e and a nozzle-tip peripheral face] turns into the gas injection tip 22.
[0027] Next, the spraying operation in the above-mentioned nozzle is explained. If gas is introduced into a gas passageway 19 from a gas inlet 18 by the required pressure, after passing orifice 19b and gas stagnation room 19c and gas circulates slot 11c of a stem 11, it will flow into revolution slot 14a of the revolution member 14. Gas serves as a revolution style in this revolution slot, and it flows into diameter reduction room 19d, and it flows into annular gas injection passage 19e with slight height, and gas pressure is injected from the gas injection tip 22.
[0028] On the other hand, the liquid containing a reducing agent is introduced into the liquid passage 17 from the liquid inlet 15, and it consists of centrum 13of 11d [of centrums in a stem 11], and nozzle tip 13 b, and liquid passage passage is carried out and it is injected from the fluid injection opening 24 at the tip of narrow diameter portion 13a.
[0029] External mixing of the gas and the liquid which are injected as mentioned above is carried out. Since gas serves as a revolution style by the revolution member 14 in that case, mixing with a liquid is promoted, consequently the atomization of liquid is promoted. And since the gas injection tip 22 is made to approach with about 1mm to the fluid injection opening 24, it can mix with a liquid in the condition that gas pressure does not fall, and the atomization of a drop can be promoted further.
[0030] Moreover, since the fluid injection opening 24 is made to project from the gas injection tip 22, it can prevent that the liquid containing the reducing agent injected from the fluid injection opening 24 contacts and adheres to the gas injection-tip 22 neighborhood. And although [the amount of protrusions of the fluid injection opening 24 /mm / about 1] it is minute, since gas is made into the revolution style, even if a drop adheres near the gas injection tip 22, it can prevent being able to disperse a drop by the revolution style, and the liquid containing a reducing agent hardening therefore, and blockading the gas injection tip 22.
[0031] Although the above-mentioned operation gestalt is the case where it applies as a nozzle for denitrification, when the nozzle of this invention is applied to other nozzles which carry out external mixing with a gas and spray the liquid containing impalpable powder, such as a mineral metallurgy group, into a viscous liquid, the same operation as the above can be done so.
[0032]
[Effect of the Invention] In the nozzle which according to this invention circulate a liquid at the core, circulate a gas on a periphery, and fluid injection opening is made to project rather than a gas injection tip, and carries out external mixing so that more clearly than the above explanation Since a revolution member is made to be placed between the gas passage of a periphery and the gas is made into the revolution style, It can prevent that having made the tip of the nozzle tip of the container liner which constitutes fluid injection opening project about 1mm rather than the tip of the outer case which constitutes a gas injection tip can also disperse the drop adhering to a gas injection tip in a gas revolution style, a drop hardens [a gas injection tip], and blinding occurs. Therefore, when it uses as a nozzle for denitrification, it can prevent that the drop containing a reducing agent hardens and a gas injection tip blockades.
[0033] Moreover, external mixing can be carried out in the condition of not reducing gas pressure to the liquid injected since fluid injection opening is made only projecting with the minute dimension of 1mm or less from a gas injection tip, since the gas is made into revolution flow, mixing with a liquid can be promoted and atomization of a drop is attained. Consequently, when a liquid can be sprayed on homogeneity and it considers as the nozzle for denitrification, a denitrification operation of gas can be raised.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view showing the example of this invention.
[Drawing 2] a part of drawing 1 -- it is a fracture front view.
[Drawing 3] It is the III-III line sectional view of drawing 1 .
[Drawing 4] It is the IV-IV line sectional view of drawing 1 .
[Drawing 5] It is the V-V line sectional view of drawing 1 .
[Drawing 6] It is the important section enlarged drawing of the above-mentioned example.
[Drawing 7] (A) is the front view of the 1st example of a revolution member, and (B) is the side elevation of this revolution member.
[Drawing 8] (A) is the front view of the 2nd example of a revolution member, and (B) is the II-II line sectional view of drawing 8 (A).
[Drawing 9] It is the sectional view showing the conventional example.
[Description of Notations]
10 Nozzle Adapter
11 Stem
12 Nozzle Body
13 Nozzle Tip
14 Revolution Member
14a Revolution slot
15 Liquid Inlet
17 Liquid Passage
18 Gas (Gas) Inlet
19 Gas (Gas) Passage
22 Gas (Gas) Injection Tip
24 Fluid Injection Opening

[Translation done.]